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COMPUTER SCIENCE NEWSLETTER

No. 76

Edited by Mr. C. Alan Ford

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THE SUGGESTION BOX

The suggestions continue to flow, with some degree of reinforcing repetition in evidence. Almost a score of submissions concerned matters best described as housekeeping (garbage cans, call buzzers, advisability of expecting neat attire amongst the Operations staff). Most of these issues have been or soon will be resolved.

Another dozen items addressed issues of priorities and limits of service ranging from deck read-in to WATFIV time limits. Read further in this Newsletter for feature items about several of these questions.

One correspondent suggested connecting a 2260 visual display unit to S/360 No. 2 to provide backlog and job status display such as exists on S/360 No. 1. Unfortunately, this would require the acquisition of a second 2848 control unit, a rather expensive device.

A long and painstaking letter was received which chided us for typographical errors, lack of clarity, and possible technical shortcomings in recent publications. Typographical errors in JCL are so easy to make yet often hard for anything but OS itself to find. Suggestions were offered in this letter which we expect to help us improve in this area. This author rates particular thanks for his concern and effort.

CHARGES FOR COMPUTER SERVICE TO RESEARCH PROJECTS DURING 1971/72

Inquiries received recently by the Centre from several users indicate uncertainty about the system of charging for computer use by research projects during the coming fiscal year. Several procedural aspects are under study and scheduled for review of the Presidential Advisory Committee on Computer Policy and Planning. However, the general principles were specified in a memorandum published by Professor G. de B. Robinson, Office of Research Administration, in November, 1970. The ideas are summarized below:

- all users pay for all priced UTCC Computer Services at published University prices;

- educational and administrative use of UTCC services are funded through the provision of computer allocations by the Allocations Sub-committee of PACCPP;

- in the case of research projects, the subsidy through the allocations procedure is less than 100%;

- for projects funded by NRC, MRC and the Canada Council 25% of the cost must be borne out of grant funds;

- projects funded by other granting agencies will be subsidized by the allocations process to the extent of 50% of the cost only;

- projects initiated by outside agencies or funded by agencies that required patent, publication or other rights in the results of the research to be transferred or retained by them, will receive no subsidy.

Users having difficulty in classifying their project according to these categories should address their problem to Mr. John G. Lockwood, Secretary of the Computer Allocations Sub-committee. Users may obtain assistance in estimating the probable cost of particular projects from Mr. Robin Williams, User's Service Group, phone 928-2694. The User's Services Group also offers assistance to users interested in improving the efficiency of their programs and thereby reducing their computing costs.

SSB's ISSUED

23:71:1	Waterloo WATLIB for High Speed Job Stream Users
2	A Note on WATLIB Members
24:71:1	Administrative Terminal System Public Terminal
2	University of Toronto Computer Centre System/360 Users Guide
25:71	Computer Centre Schedule for Holiday Weekend, May 22nd to May 24th, 1971

BULLETIN - COMPUTER SCIENCE CLUB

New Executive

The new executive of the University of Toronto Student Chapter of the ACM (alias the Computer Science Club) is:

Pres:	John Kornatowski	928-3596
V-Pres:	Philip Khaiat	928-6254
Sec:	Mike Bauer	928-8725
Treas:	Adam Chamot	534-8712
Staff Adviser:	Al Borodin	928-6416

Visit to University of Montreal

Dr. Gotlieb has mentioned that any students who might be interested in touring the University of Montreal's Computing Facility would be welcome to do so.

Very tentatively, the idea would be to spend a couple of days in Montreal sometime in June. For example, Friday would be spent at the University, Saturday touring Montreal and Sunday returning to Toronto.

Would anyone interested please leave his name and telephone number on a list posted on the door of MP 1212. Also, any comments on timing and/or whether or not you could provide transportation would be appreciated.

ERRATA TO NEWSLETTER #75

1. Page 19, Section 2, line 6 should read:-

```
// UNIT=2314,VOL=SER=serial,DCB=(RECFM=U,BLKSIZE=7294),
```

The "," between "serial" and "DCB" had been omitted.

2. Page 21, Section c, line 5 should read:-

```
//SORTOUT  DD  UNIT=2400,DSN=name,VOL=SER=serial,
```

"DSN" had been printed "SDN".

RECENT ACQUISITIONS IN THE DEPARTMENT OF COMPUTER SCIENCE LIBRARY

Colloquium in Numerical Taxonomy, University of St. Andrews, 1968.
Numerical taxonomy. 1969.

Watson, Walter A. et al.
Numerical analysis - the mathematics of computing. 1969.

ACM Symposium on Theory of Computing, 2d, Northhampton, Mass., May 1970.
Conference record.

Association for Computing Machinery. Committee on Professional Activities of the Blind.
The blind in computer programming - an international conference. 1969.

Ballard, Alan John.
Transformations of programs. (M.Sc. thesis) 1970.

Beckett, R.
Numerical calculations and algorithms. 1967.

Bell, C. Gordon, and Newell, A.
Computer structures: readings and examples. 1971.

Celia, C. W.
An introduction to numerical analysis. 1969.

Gross, M. and Lentin, A.
Introduction to formal grammars. 1970.

IBM Symposium on Sparse Matrices and Their Applications, Yorktown Heights, N. Y., September 1968.
Proceedings.

Johnson, L. R.
System structure in data, programs, and computers. 1970.

Martin, J., and Norman, A. R. D.
The computerized society: an appraisal of the impact of computers on society over the next fifteen years. 1970.

Milandre. G. R.
Process synchronization in operating systems. (M.Sc. thesis) 1971.

Mitchell, A. R.
Computational methods in partial differential equations. 1969.

Moisil, G. C.
The algebraic theory of switching circuits. 1st English edition. 1969.

National Federation of Science Abstracting and Indexing Services.
Proceedings of the annual conference, 1969.

Spitzbarth, L. M.
Basic COBOL programming: self-instructional manual and text. 1970.

Weinberg, G. M.
PL/1 programming: a manual style. 1970.

INFORMATION PROCESSING LETTERS (N. HOLLAND PUB. CO., AMSTERDAM)

The publishers of IFIP material have initiated a bimonthly publication devoted to the rapid dissemination of short contributions in the field of information processing. Volume I, No. 1 (the only volume scheduled for 1971) discloses a technical journal format and a publishing policy which favors speed rather than careful proofreading. Watch out for the inevitable typographical errors.

The slates of internationally renowned editors and referees include C. C. Gotlieb, J. N. P. Hume, and D. Tsichritzis of this university. The academic computer science community should find a considerable interest in these Letters as a source of information and as an outlet for interim findings from ongoing studies.

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ON SYSTEM SCHEDULING

A suggestion received in April urged that the scheduling algorithm be reviewed in these pages. More recent suggestions have also indicated the need for such a review which now follows.

Primary control over the scheduling is through HASP classes. HASP passes jobs to OS/MVT which controls the actual computation of the job steps. HASP will select a RUSH job (R, S, T classes) for service in advance of any ASAP job (A, B, C, D, E, V). Likewise any ASAP job will be selected in preference to any If-Otherwise-Idle job (I, J, K, M). If a lower-class job has already gone to OS for execution, it does not roll out to let a higher-class job "play through". This means longer ASAP or IOI jobs can impede any immediate processing of a newly arrived RUSH job.

OS/360 does not offer a practical way to permit high priority play-through. We have taken guard against long low-priority jobs overwhelming the system, however.

Job time estimates do affect scheduling somewhat. RUSH jobs over five minutes of processing time are unacceptable, in order to assure suitable responsiveness to enough users. ASAP and IOI jobs beyond five minute duration are also deferred in favor of any shorter ones in their class. Time barriers also exist for ASAP and IOI classes at the ten, twenty, and thirty minute mark. This protects majority interests in turnaround. Ninety percent of jobs commonly fall within the zero-to-five minute band.

HASP controls printing, again influenced by artificial job-size barriers which give preference to jobs of zero to five thousand lines of print. Ten, twenty and thirty thousand line barriers also exist. RUSH jobs are limited to the zero-to-five thousand range but class does not otherwise influence print scheduling. Long print jobs may be scheduled automatically by HASP if shorter ones do not exist at the moment. This effect has slowed RUSH turnaround on occasion. Hint: don't spend at RUSH rates on a lightly loaded system.

It is appreciated that these algorithms are not perfect. Modifications are regularly proposed, evaluated and adopted if suitable. Ways to improve ease and clarity for the user are always being sought.

With regard to a related question on whether core is "compactified", the answer is no. The core allocation routine scans from the highest core address down until it finds a contiguous region large enough for that requested by the job step. It then allocates the requested region. Hence there will always be unused regions of core that are too small to be useful. This affects the overall efficiency of the system. A job once scheduled for execution is not re-scheduled but waits for the core to become available. This waiting time depends on the amount of core requested. For jobs requiring 110K or less this wait time is low but can be several minutes for jobs requiring increasingly large regions. Jobs requiring more than 300K are specially scheduled by Operations for service when the core is available.

The analytically minded may find interest in the table which follows. This shows how the systems and users responded to variations in the workload during three months straddling the March busy season. Except for variations in average job size, the patterns remained remarkably steady.

Service Factor Relationships in HASP/MVT Production

	FEBRUARY	MARCH	APRIL
Number of Jobs	17,283	26,602	22,553
Formula Time	33,952 min.	44,702 min.	41,805 min.
R, A, I Mix:			
- RUSH, No. of Jobs	26%	24%	28%
- ASAP, No. of Jobs	60%	64%	59%
- IOI, No. of Jobs	14%	12%	13%
TOTAL	100%	100%	100%
- RUSH, Form. Time	11%	11%	13%
- ASAP, Form. Time	58%	60%	56%
- IOI, Form. Time	31%	29%	31%
TOTAL	100%	100%	100%
Form. Time per Job:			
- RUSH	0.85 min.	0.76 min.	0.85 min.
- ASAP	1.47 min.	1.59 min.	1.75 min.
- IOI	4.42 min.	4.00 min.	4.44 min.
- All Classes	1.96 min.	1.68 min.	1.85 min.
Mean Service Factor Premium, Based on Formula Time			
- S/360 No. 1	102%	104%	103%
- S/360 No. 2	92%	93%	96%
- Overall	98%	100%	100%

SUMMARY OF UTCC PUBLICATIONS

The following UTCC publications are available from the Administrative Office, Room 131 Sandford Fleming and as specially indicated.

1. USER'S REFERENCE MANUAL ($2.00):

   - provides the technical and administrative material necessary for running programs at UTCC. Newsletter and SSB information absorb into subsequent revisions of URM. First revision to be available on or around July 1;

2. UTCC SYSTEM/360 USER'S GUIDE (no charge):

   - an introduction to UTCC. May be obtained in Rooms 107, 109, 115A or 130 of the Sandford Fleming Building;

3. CPS TERMINAL USER'S GUIDE ($6.00):

   - the primary publication for anyone wishing to use CPS or CPS/RJE. Copies available at the University of Toronto Bookstore;

4. CPS/RJE SAMPLE SESSION GUIDE (no charge):

   - illustrates the use of CPS/RJE. May be obtained in S.F. Room 103;

5. ATS/360 HIGH-SPEED INPUT/OUTPUT (no charge):

   - provides instructions pertaining to high speed input/output operations (e.g., magnetic tape, printer) for ATS documents. Copies available in S. F. Room 103;

6. A GUIDE TO FORMAC (no charge):

   - designed to familiarize users with the capabilities of FORMAC;

7. FORMAC PROGRAMMER'S GUIDE ($3.00):

   - a reference manual for FORMAC users;

8. PLOTTING WITH CALCOMP USING OS/360 ($1.25):

   - provides technical information for FORTRAN-oriented programmers writing graphic computer programs in FORTRAN on an IBM/360 computer intended for CALCOMP off-line plotting;

9. LIBRARY OF STATISTICAL PROGRAMS (no charge):

   - an introduction to the statistical packages available at UTCC. Available in S.F. Room 130;

10. HIGH SPEED JOB STREAM WATFIV USER'S GUIDE (no charge):

    - to be available on or about June 1. To be distributed at the EUT and ASUT terminals.

WATFIV TO REPLACE WATFOR

After careful review and discussion with vitally interested teaching and research users, it has been planned to drop WATFOR in favor of WATFIV, effective September 1, 1971. Any user who feels threatened by this change should confer with R. Williams (928-2694) or J. Boddy (928-6317).

A special report is available from UTCC which augments material published in Newsletter 75. It is avialable upon request at Rooms 103, 115A, 128, or 131 Sandford Fleming Building

WATERLOO WATLIB VIA WATFIV

The University of Waterloo WATFIV WATLIB is now available to HIGH SPEED JOB STREAM SERVICE USERS (reference SSB 23:71). This library is a collection of some 300 FORTRAN IV subroutines accessible via the WATFIV Compiler. The library is split up into the following areas of application:-

PACKAGE 'A': Polynomials, Functions, Approximation Routines

1. Evaluation of Polynomials
2. Operations on Polynomials
3. Roots of Polynomials and Solution of non-linear and transcendental equations
4. Evaluation of Special Functions
5. Series Expension of Special Functions
6. Numerical Integration
7. Numerical Solution of Ordinary Differential Equations
8. Numerical Summation
9. Interpolation

PACKAGE 'B': Least Squares Curve Fitting and Optimization

1. Curve Fitting without a Model Equation
2. Curve Fitting with a Model Equation
3. Linear and non-linear Optimization

PACKAGE 'C': Matrix and Vector Operations and Simultaneous Linear Equations

1. Operations on Matrices
2. Eigenvalues and Eigenvectors
3. Analytic Function of a Matrix
4. Determinants
5. Solution of Simultaneous Linear Equations
6. Operations on Vectors

PACKAGE 'D': Statistics and Random Number Generators

1. Number Generators
2. Statistics

MISCELLANEOUS ROUTINES

1. Printer Plots
2. Histograms
3. Character Handling Routine
4. PAK/UNPAK WATFIV Source Cards

A listing of the available routines together with a short description of their purpose may be obtained by running the following job through the GENERAL PURPOSE (HASP) JOB STREAM.

```
  HASP Jobcard
//RETRIEVE EXEC RETRIEVE
//RETR.DATASET DD  DSN=IC.WAT5LIB,DISP=SHR
//RETR.SYSIN DD *
          PRINT MEMBER=ABSTRACT
/*
//
```

PRINT should start in Column 10
MEMBER should start in Column 16

Documentation of individual routines is available from Mr. René Lemmens, Room 130 of the Sandford Fleming Building (928-8701). Also any problems encountered with this package should be brought to the attention of Mr. Lemmens.

PROCESSOR LIMITS ON HIGH SPEED JOB STREAM

The idea behind the HIGH SPEED JOB STREAM SERVICE is to offer a fast service for debugging or for running students' short jobs.

Severe and strict job stream limitations are required to keep the service quick. Execution time is one of these limitations. On September 1st, 1971 the WATFOR and ALGOLW maximum execution time limits will be reduced to 10 seconds in order to improve the HSJS performance within the intentions for it. The following table gives before-and-after HSJS Processor job limits:-

	BEFORE SEPT. 1st 1971			AFTER SEPT. 1st 1971		
PROCESSOR	TIME	LINES	PAGES	TIME	LINES	PAGES
WATFOR	24 sec.	300	8			
WATFIV	10 sec.	300	8	10 sec.	300	8
ALGOLW	20 sec.	300	8	10 sec.	300	8
ASMG	10 sec.	200	5	10 sec.	200	5
SIMON	5 sec.	100	2	5 sec.	100	2

It should be noted that these limits are on job execution only and that almost any job will be compiled or assembled. The recent augmentation in region size helps here. It is therefore perfectly feasible that main programs and subroutines can be debugged within these constraints. However, once debugging has been completed, use the HASP General Purpose Job Stream for production running.

It is intended to produce in the next Newsletter some data from studies now underway which shown what can be done by a HSJS WATFIV job within the 10 second limit;

Please note that defaults are not necessarily limits. WATFIV has a handy 3 second execution default value but the limit of 10 seconds can be set using the $Job card.

COBOL F PHASING OUT

IBM has announced that the COBOL F compiler will be downgraded in its level of support on S/360 and will not be supported on S/370. An ANS COBOL will replace it at the Class A support level on S/360. A later Program Product version of the ANS COBOL will be required for S/370.

Our few COBOL users should find the pace of this changeover slow enough to cause no serious problem. The ANS standardization may prove a long-term benefit.

Watch these pages and the System Status Bulletins for further announcements about ANS COBOL.

APL COMING

APL in its OS/360 version has been installed in the No. 1 Model-65 and is now under in-house checkout. Plans call for general release to University of Toronto users in July. Enquiries should be directed to Mr. Sam Goldfarb, Manager of Interactive Systems, 928-3787.

PRODUCTION STATISTICS

A slump in the number of jobs being processed daily has occurred as anticipated. Table I illustrates the seasonal effect. As usual, the typical job size has increased. The work load is thus sustained at a comfortable level, giving good turnaround while meeting projected production volumes.

Table II shows the 1970/1971 April comparison. The shift away from 7094 was no surprise. The rise in S/360 volume is good especially since the April 1970 volume had remained quite strong. The minor slump in High Speed Job Stream activity is consistent with a topping-out tendency observed last month (NL 75). This remains unexpected and unexplained.

SYSTEM	FEB	MAR	APR	APR/MAR CHANGE
S/360	16,444	23,864	19,598	-18%
7094	1,042	1,690	1.293	-24%
HSJS	65,888	78,834	48,756	-38%
TOTAL	83,374	104,388	69,647	-33%

TABLE I: Number of Jobs Processed; Feb, Mar, Apr, 71

SYSTEM	APR '70	APR '71	70/71 CHANGE
S/360	15,502	19,598	+26%
7094	3,554	1,293	-44%
HSJS	50,672	48,756	- 4%
TOTAL	69,728	69,647	- 0%

TABLE II: Comparison of April 1970 With April 1971.

SYSTEM RELIABILITY

The reliability of the S/360 systems for February, March and April are shown in the following table for comparison.

SYSTEM	MONTH	UPTIME	MTBF
S/360 #1	February March April	93.6 % 98.8 % 99.3 %	9.3 hrs. 13.1 hrs. 23.8 hrs.
S/360 #2	February March April	94.1 % 94.6 % 93.3 %	6.8 hrs. 5.0 hrs. 10.6 hrs.

Uptime increased substantially on System #1 over the last two months, following the solution of problems in the multiplexor channel which had plagued the system until the end of February.

The continued unsatisfactory performance on System #2 in March was attributed to a loose cable on the multiplexor channel. There were also problems with the extra 256K fast core installed on System #2. Both hardware problems have been corrected and a dramatic improvement in System #2 performance is expected in May. Early statistics for May are reassuring.

CREDIT REQUEST SUMMARY

	THIS MONTH			LAST MONTH
	S/360	7094	TOTAL	TOTAL
HUMAN	25	11	36	17
SOFTWARE	2	5	7	14
HARDWARE	7	2	9	11
TOTAL	34	18	52	72
	PERCENT OF JOBS		0.25%	0.28%

The reduction of activity in April, measured as number of jobs, was accompanied by a decline, absolute and relative, in the incidence of credit claims. A major loss in Calcomp output (12 cases) boosted the Human Error count well above what would have been a very good figure.

SERVICE SCHEDULES

July 1st - Dominion Day Holiday

The Computing Centre will be closed from 1:00 a.m. Thursday, July 1st until 9:00 a.m. Saturday, July 3rd. Normal weekend service will be provided on Saturday, July 3rd and Sunday, July 4th between 9:00 a.m. and 5:00 p.m.

July and August Weekend Service

Normal weekend service between 9:00 a.m. and 5:00 p.m. on Saturday and Sunday will be provided during July and August. If the work load is extremely "light" on weekends in the summer months, the Computing Centre may close on Sundays. Watch for further notices.